TITLE: PURIFICATION AND STRUCTURE DETERMINATION OF PFIESTERIA AND OTHER ALGAL TOXINS

MILESTONE SHC 2.5.1: Provide one forecast on the occurrence, distribution, and frequency of a harmful algal bloom in the U.S. and develop capability to provide future forecasts.

CCEHBR SCIENTISTS/INVESTIGATORS: Peter Moeller/Steve Morton (Co-Pi's), Mark Busman, Kevin Beauchesne, Stephen Eaker, Christina Mikulski, Jennifer Maucher, John Ramsdell

OBJECTIVES OF RESEARCH ACTIVITIES: Culture large quantities of algae as a source of both known and unknown toxins. Detect, isolate, purify, and structurally characterize naturally occurring bioactive compound(s).

DESCRIPTION OF RESEARCH ACTIVITIES:
Purification and structural elucidation are critical fundamental areas of all toxin research. These activities require the use of high field nuclear magnetic resonance (NMR) and LC-mass spectrometry in efforts to obtain structurally characterized, purified quantities of toxins for subsequent studies in pharmacology and toxicology. Three-dimensional structural information of toxins gives direct insights into mode/site of action based on structure/function relationships of biologically active compounds. Knowledge of functional groups situated on a toxin provides direct chemical information in efforts focused on remediation/mitigation of toxic effects.

Graphic/Images/Figures
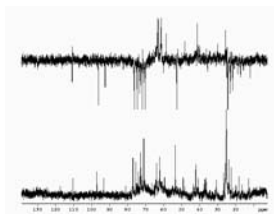
13C NMR of *Trichodesmium* toxin
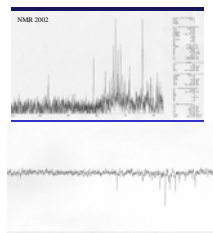
13C of *Pfiesteria* toxin

NMR spectra obtained for newly discovered toxins from *Pfiesteria piscicida* and *Trichodesmium thiebauti*

Selected Highlights

Novel purification methodology has been developed to isolate and purify the water-soluble toxins derived from *Pfiesteria piscicida*. Sufficient quantities of one of these toxins has been produced to provide the first NMR spectrum depicting a glycosidic nature of the active substituents. This information is being used to provide more efficient methods for preparative amounts of toxin.

Similar work has been done on a project initiated in 2002 to isolate a toxin from *Trichodesmium thiebauti*. This water-soluble toxin has been implicated in human illness and has remained uncharacterized for decades.

Novel methods have been employed to obtain the first NMR spectrum of a lipophilic toxin derived from *Alexandrium monilatim*.

Publications/Reports:

Moeller, P.D.R., S.L. Morton, B.A. Mitchell, S.K., Sivertsen, E.R.Fairey, T.M. Mikulski, H. Glasgow Jr., N.J. Deamer-Melia, J.M. Burkholder, J.S. Ramsdell. 2001. Current Progress in isolation and characterization of toxins isolated from *Pfiesteria piscida*. Environmental Health Perspectives, 109, Suppl. 5 739—744

Presentations:

Morton, S.L. C. M. Mikulski, P.D.R. Moeller, S. Eaker, K. Steidinger, B. Richardson, and J.S. Ramsdell Possible bioactive compounds produced by *Pfiesteria*-like dinoflagellages isolated from Florida, USA. Xth International Conference on Harmful Algae, 2002, St. Petersburg, FL.

Morton, S.L T. Villareal, S. Eaker, M. Hsia, T. Schock, and P.D.R. Moeller. Algicidal activity of a water-soluble compound extracted from *Trichodesmium thiebauti*. Xth International Conference on Harmful Algae, 2002, St. Petersburg, FL.